Descriptive epidemiology of opioid overdose deaths in Broome County, based on death certificate data files from New York State Department of Health's Vital Statistics Division

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1 Background and Methods

Opioid overdoses, including fatal overdoses, are increasing nationwide. Broome County has not been spared from this phenomenon. It is therefore of interest to monitor the magnitude of the problem in our county.

The frequency of deaths from opioid overdose is one of several indicators that can provide insight into the magnitude of the opioid overdose problem locally. This report describes the number of opioid overdose deaths in Broome County between 2009 and 2014 inclusive, and some of the characteristics of those deaths.

Electronic death certificate files were obtained from New York State Department of Health Vital Statistics system. These include primary and, if necessary, multiple contributing causes of death for each decedent. The causes are coded according to ICD-10. ICD-10 is a hierarchical or nested classification system. The codes are alphanumeric. The first three characters indicate a general category (for example, T40 for "Poisoning by narcotics and psychodysleptics [hallucinogens]." Additional characters provide more specificity (for example T401 for "Poisoning by narcotics and psychodysleptics [hallucinogens], heroin."

There is no checkbox on a death certificate to indicate that the cause of death was opioid overdose. Making that distinction *depends entirely on which ICD-10 codes one chooses to include in one's definition.* For this analysis, a death was considered to be a case of opioid overdose if the primary or any contributing cause was among those listed in Table 1. Deaths without any of those codes as primary or contributing cause were considered controls (non-cases, or death unrelated to opioid overdose).

While ICD-10 is by default the schema by which death certificates are ultimately classified, it should be noted that it presents some difficulties for unambiguously identifying opioid overdose, or the more specific subset of heroin overdose. Thus it is important to understand and appraise critically the methods used in any overdose epidemiology report. ICD-10 uses the term "narcotic," which is sometimes interpreted differently in different settings (e.g. medical versus law enforcement.) Additionally, it does not make pharmacologic sense to include narcotics (read "opioids") and psychodysleptics/hallucinogens in the same category—but ICD-10 does exactly that. Because of these issues, the criteria to define a case of overdose in this report may be somewhat over-inclusive. On the other hand, clinical experience suggests that overdose on hallucinogens is much less often fatal than overdose on opioids. Additionally, the F19 code (see Table 1) can be problematic: it is rather broad, potentially including patients who died without any *opioid* involvement.

In the Results section, frequencies and percentages too low to report for privacy purposes are masked with " * ".

ICD-10 code	narrative description
T40	Poisoning by narcotics and psychodysleptics [hallucinogens]
T400	Poisoning by narcotics and psychodysleptics [hallucinogens] , opium
T401	Poisoning by narcotics and psychodysleptics [hallucinogens] , heroin
T402	Poisoning by narcotics and psychodysleptics [hallucinogens] , other opioids
T403	Poisoning by narcotics and psychodysleptics [hallucinogens], methadone
T404	Poisoning by narcotics and psychodysleptics [hallucinogens] , other synthetic narcotics
T406	Poisoning by narcotics and psychodysleptics [hallucinogens] , other unspecified narcotics
X42	Accidental poisoning by and exposure to narcotics and psychodysleptics [hallucinogens], not elsewhere classified
F11	Mental and behavioural disorders due to use of opioids
F19	Mental and behavioural disorders due to multiple drug use and use of other psychoactive substances
Y12	Poisoning by and exposure to narcotics and psychodysleptics [hallucinogens], not elsewhere classified, undetermined intent
X62	Intentional self-poisoning by and exposure to narcotics and psychodysleptics [hallucinogens], not elsewhere classified

Table 1: ICD-10 codes that define a case of fatal opioid overdose in this report

Table 2: Number of deaths by year

	2009	2010	2011	2012	2013	2014
non-overdose	2057	1979	2045	2013	2057	1995
opioid overdose	*	20	20	21	27	30

Table 3: Highest educational level completed by opioid overdose decedents, shown as percentages

	non-overdose(%)	opioid overdose(%)
less than high school diploma	22	16
high school graduate or GED	51	58
some college, no degree	7	12
college or graduate degree	19	12
unknown	1	2

2 Results

For the study period, data on 12271 deaths were available. There were 125 cases, representing 1.02 percent of all deaths. The number of opioid overdose deaths has gone only upward during the study interval. (Table 2). Of the 125 cases, 82 were men. Men are significantly over–represented among opioid overdose deaths ($\chi^2 = 17.44$, $p = 0$). The median age at death was 38. The age distributions of the bulk of overdose and non-overdose deaths (excluding extremes of age for privacy purposes) is shown in Figure 1.

Educational level of the decedents is shown in Table 3. There was a trend toward lower levels of education among the cases than among the controls (p = 0.005), driven probably by the under–representation of completed college and graduate degrees among the cases.

Of the 125 cases, 48 had been hospitalized during the previous two months (undoubtedly at least some of these hospitalizations were for the fatal overdose in question.) Among those overdose patients hospitalized, the length of stay ranged from 0 to 16 days, with a median of 1 days and a mean of 3.1 days. The locations of deaths are shown in Table 4; the distribution of places is significantly different for cases versus controls (Fisher's exact test, $p = 5e - 04$).

Autopsies were reported on 103 of the 125 cases. Not unexpectedly, autopsies were substantially more common among cases than among controls. Manner of death is shown in Table 5. Comparing the categories of manner of death, there is a significant difference between cases and controls, with "accident" and "pending investigation" being more common among cases, and "natural causes" being
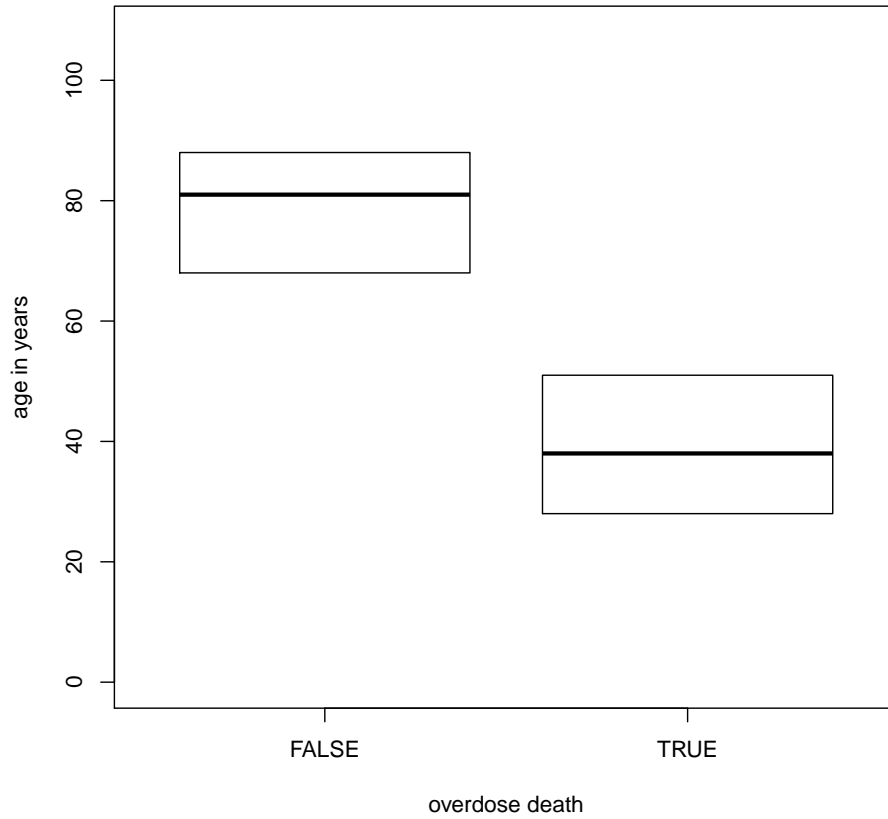
Figure 1: Age distribution of people dying from opioid overdose versus other causes

Table 4: Place of death among opioid overdose patients, shown as percentages

	non-overdose(%)	opioid overdose(%)
Hospital - DOA	0	1
Hospital - ER	5	18
Hospital outpatient	0	1
Hospital inpatient	38	16
Nursing home	27	2
Decedent's residence	26	44
Other private home	2	14
Assisted Living and Adult Homes	0	0
Hospice Facility	0	0
Other non-institution	1	2
(NYC only) Not in hospital	0	0
Other institution	0	1

Table 5: Manner of death among opioid overdose patients (shown as percentages)

	non-overdose(%)	opioid overdose(%)
natural cause	96	21
accident	2	57
homicide	0	*
suicide	1	6
undetermined	0	*
pending investigation	0	13

less common. (Fisher exact test, $p = 5e - 04$).

3 Discussion

Opioid overdose deaths increased in Broome County between 2009 and 2014; the steepest increase occurred between 2009 and 2010.

People dying from opioid overdose are generally in their young- to mid-adult years. About two-thirds of them are men.

The manner of death has usually been listed as natural cause, accident, or pending investigation.

The locations of death in Table 4, the information about prior hospitalizations, and substantive knowledge of the usual sequence of events during a hospital encounter, all suggest that many patients are dead at the scene of their overdose, which is usually someone's residence—perhaps their own, perhaps not. This should inform our interventions to prevent opioid overdose deaths. Recent efforts to speed the delivery of naloxone by deploying an intranasal formulation with law enforcement officers and basic EMTs are worthwhile for patients who are observed overdosing or are found soon thereafter. However, it seems many patients are found at home long after their overdose, obviously dead and beyond hope of resuscitation. For these patients, the prompt availability of naloxone is a moot point. Efforts to minimize unobserved dosing, overdosing, and subsquent death are warranted. These might include:

- public messages encouraging addicts not to use alone

- better outreach and education for family and friends on how to recognize overdose more promptly.

Opioid death rates based on death certificate data files from the New York State Vital Statistics system are one useful indicator of the opioid problem in Broome County. There are, however, other potentially useful data: rates of naloxone use on EMS calls, rates of opioid–positive urine drug screens at hospital laboratories, rates of visits to emergency departments for non–fatal opioid overdose, and locally–maintained databases of preliminary death certificates. Each of these indicators has its strengths and weaknesses, in terms of timeliness, accuracy, and availability. For example, official New York State Department of Health Division of Vital Statistics death certificate files for 2015 probably will not be available until approximately spring of 2017. Furthermore, it is to be expected that surveillance of different indicators of the same health phenomenon will produce different numbers. Nevertheless, all of these indicators complement each other in our efforts to develop a more complete understanding of the opioid situation in Broome County.